# River Bioassessment by Volunteers (RBV) Program

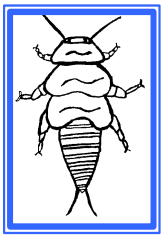
*A CT DEEP Tier 2 Volunteer Water Quality Monitoring Network*

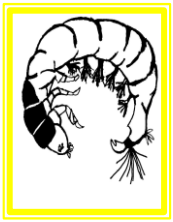
# MACROINVERTEBRATE FIELD IDENTIFICATION CARDS

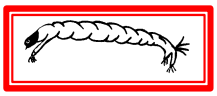

**This project was funded in part by the CT DEEP (formerly CT DEP) through a U.S. EPA Clean Water §319 Nonpoint Source grant.**

# ABOUT THE CARDS

At the core of the RBV program are the macroinvertebrates represented on these cards. Each organism has distinct shape, structure, color, or behavior and provides key ecological information about the stream environment. Each card lists the common name across the top and the category at the bottom. These bands are color-coded based on the ecology of each organism. **Blue = Most Wanted**; In general these organisms require a narrow range of environmental conditions. When found in abundance one can infer non-impaired stream condition. **Yellow = Moderately Wanted**; These organisms can be found in a variety of water quality conditions. When found in abundance further information about the upstream watershed may be necessary to infer water quality. **Red = Least Wanted**; These organism tend to be very tolerant of a wide range of environmental conditions. As a result when these organisms comprise the majority of a sample, one can infer some level of water quality impairment.







***Key Features and Key Behaviors to look for:*** These bullets can help to make a positive identification of an organism. Remember, these cards do not represent every type of macroinvertebrate likely to be encountered only a small subset.

***Points of Note:*** This section contains additional information which may help to clarify an identification. Often subtle differences between 2 or more of the organisms are described.

**Ecological Information:**
***Tolerance Values:*** range from **0** to **10**. Organisms with low values **(0-3)** are considered to be very sensitive to decreased water quality. Organisms with high values **(6-10)** are considered not sensitive to decreased water quality. Macroinvertebrates with high tolerance values may be found in all types of water quality while those with lower values are usually only found in streams characterized by higher water quality.

***Feeding Group:*** is the food source utilized by the organism. The 5 major feeding groups are; Collector-filterer, Collector-gatherer, Predator, Scraper, and Shredder. Streams characterized by high water quality often have a balanced mix of feeding groups.

**The RIVER BIOASSESSMENT BY VOLUNTEERS (RBV)** Program is a citizen-based water quality monitoring program developed by the Connecticut Department of Energy and Environmental Protection's (CT DEEP) ambient monitoring program. The **RBV** program was developed to encourage and facilitate usable volunteer data. **RBV** allows volunteer monitors to capitalize on the utility of macroinvertebrate data while keeping the methods and equipment standardized, inexpensive, and relatively quick and easy to implement.

Following the standard procedures, volunteers collect benthic macroinvertebrates in the fall (September through November) from a riffle in a local stream believed to be characterized by good water quality. The final product will be a completed data sheet and representative voucher collection containing one of each macroinvertebrate type collected. The datasheet and voucher are submitted to DEEP for review. The entire process occurs at the stream site and can be completed by 2-4 monitors within approximately 2 hours.

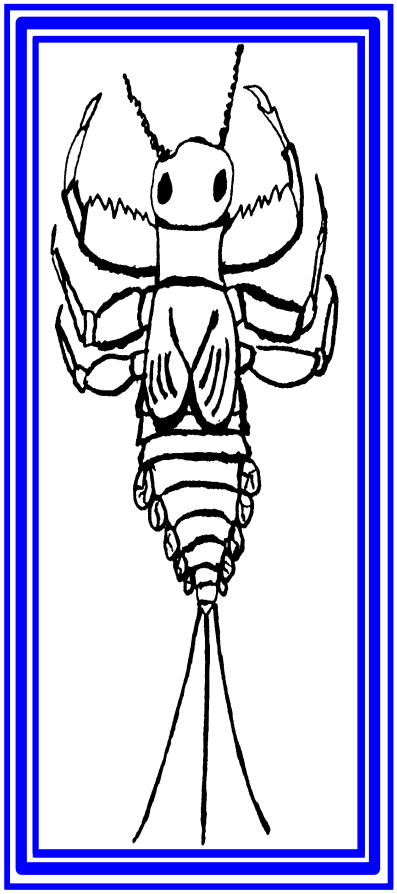
**For more information about the RBV program, including the instruction manual, please contact the DEEP volunteer monitoring coordinator, Meghan Ruta, at (860) 424-3160 or Meghan.ruta@ct.gov, or visit www.ct.gov/deep/rbv**

# PANEL # 1

# BODY-BUILDER MAYFLY

**Genus** *Drunella*
**Family** Ephemerellidae
**Order** Ephemeroptera

**Ecological Information**
**Tolerance Value =** 0
**Feeding Group =** Scraper



**Key features to look for:**

- ☐ First section of the front legs look like muscular biceps.
- ☐ Front legs have a serrated edge.
- ☐ Flat body with obvious legs.
- ☐ 3 tails at the end of the abdomen.
- ☐ Single set of wing pads.
- ☐ Small round gills on the sides of the abdomen.

**Key behaviors to look for:**

- ☐ This mayfly nymph will crawl among leaves, stones, and other debris in the tray.
- ☐ Occasionally it may swim by slowly undulating back and forth.

**Points of Note:**

This organism can be confused with other members of the same family. These mayflies can be very abundant under appropriate conditions. The defining feature of this organism is the enlarged front legs with a serrated edge.

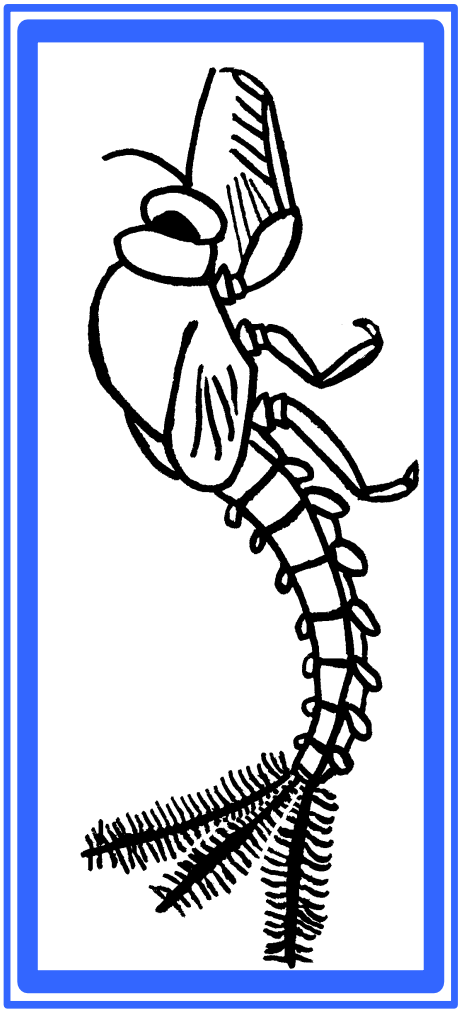
# MOST WANTED

PANEL # 2

# MINNOW MAYFLY

**Genus** *Isonychia*
**Family** Isonychidae (Oligoneuriidae)
**Order** Ephemeroptera

**Ecological Information**
**Tolerance Value =** 2
**Feeding Group =** Collector-Filterer



**Key features to look for:**

- ☐ Streamlined body, taller than wide, humped back.
- ☐ Front legs have many long hairs on the inside edge.
- ☐ 3 feather-like tails at the end of the abdomen.
- ☐ Single set of wing pads.
- ☐ Small round gills on the sides of the abdomen.
- ☐ Dark colored body sometimes with a yellow stripe.
- ☐ Large size (approximately 3/4 inch).

**Key behaviors to look for:**

- ☐ This mayfly nymph is an extremely strong swimmer. It swims by undulating back and forth very rapidly.
- ☐ The mayfly often stands on rocks, leaves and sticks.

**Points of Note:**

When present in a sample, these organisms are easy to located in the tray. They are extremely fast and strong swimmers. Unlike most mayfly nymphs, the body is taller than it is wide. Look for the 3 tails each with many small hairs. The tails act as an oar, propelling the nymph through the water.

# MOST WANTED

# PANEL # 3

# TWO-TAILED FLATHEAD MAYFLY

**Genus** *Epeorus*

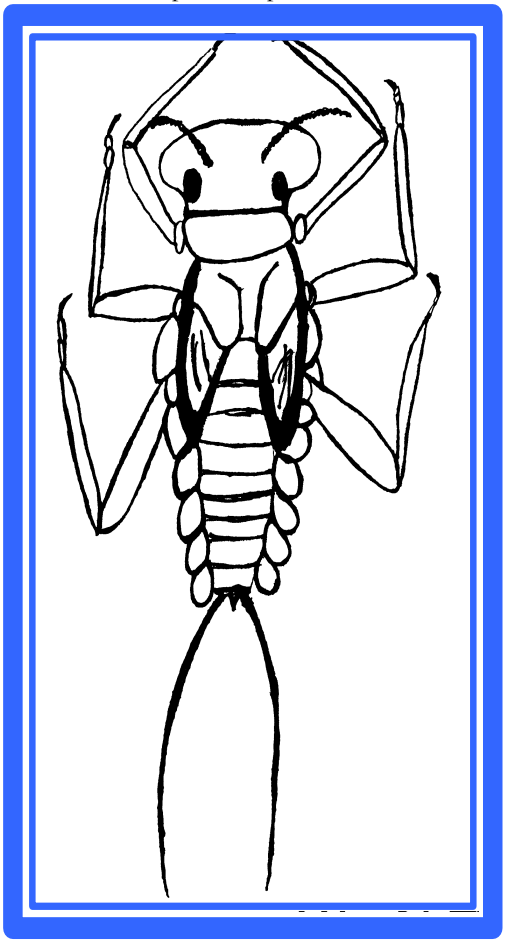
**Family** Heptageniidae

**Order** Ephemeroptera

**Ecological Information**

**Tolerance Value =** 0

**Feeding Group =** Scraper



**Key features to look for:**

- ☐ Extremely flat body, long thin legs.
- ☐ Almost translucent body.
- ☐ 2 long thin tails at the end of the abdomen.
- ☐ Single set of wing pads.
- ☐ Small round gills on the sides of the abdomen.
- ☐ Wide flat head, obvious eyes.

**Key behaviors to look for:**

- ☐ This mayfly nymph crawls very fast on the surface of stones.
- ☐ It may try to swim by wiggling side to side.
- ☐ Will try to hide under any object in the tray.

**Points of Note:**

The best way to find these mayfly nymphs is to carefully examine cobbles before kick sampling. When present, these mayflies will scurry along the surface of the rock. Because of their body color and shape, they can be very difficult to spot. Positive ID combines the body shape with only 2 tails. These can be extremely abundant when conditions are appropriate.

# MOST WANTED

# PANEL # 4

# ROACH-LIKE STONEFLY

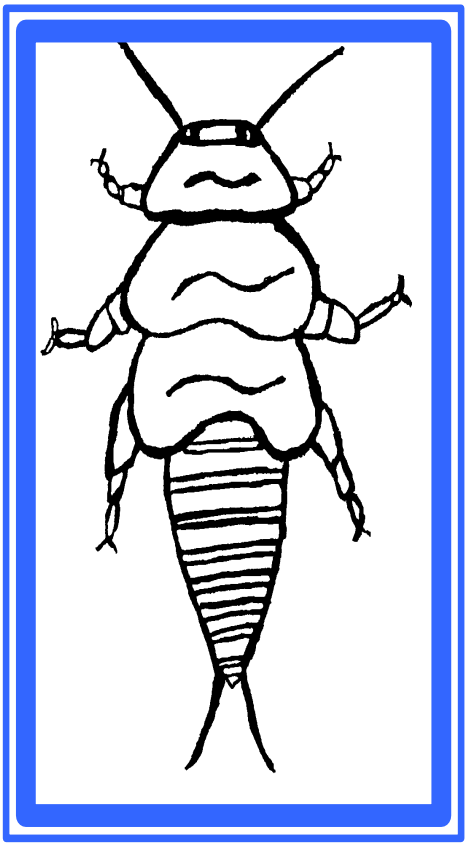
**Family** Peltoperlidae

**Order** Plecoptera

**Ecological Information**

**Tolerance Value =** 0

**Feeding Group =** Shredder



**Key features to look for:**

- ☐ Tear-drop body shape.
- ☐ Uniformly shinny brown exoskeleton.
- ☐ 2 tails at the end of the abdomen.
- ☐ Two sets of wing pads.
- ☐ No gills on the sides of the abdomen.
- ☐ No larger than 1/2 inch.

**Key behaviors to look for:**

- ☐ This stonefly nymph is commonly found crawling in and amongst leaf packs in riffle areas.
- ☐ Peel apart leaves, look for these stoneflies crawling around.
- ☐ May occasionally try to swim by moving side to side.

**Points of Note:**

This stonefly nymph is easily identified by the tear-drop body shape. Many times they are described as horseshoe crab like or little trilobites. The smooth exoskeleton makes them very slippery when trying to pick them up with forceps.

# MOST WANTED

# PANEL # 5A

# COMMON STONEFLY

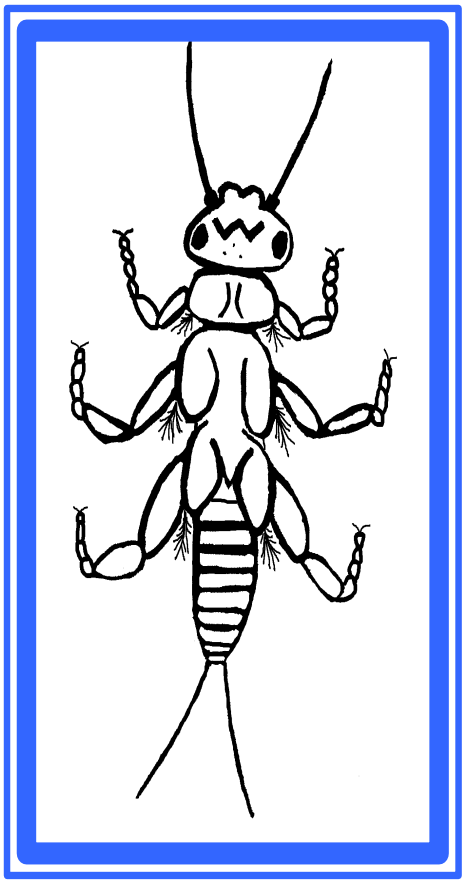
**Family** Perlidae

**Order** Plecoptera

**Ecological Information**

**Tolerance Value =** 1

**Feeding Group =** Predator



**Key features to look for:**

- Large active organism (up to 1.25 inches).
- Flat body with obvious legs.
- Dark body with or without pattern.
- 2 tails at the end of the abdomen.
- Two sets of wing pads.
- Gill tufts at the base of each leg.

**Key behaviors to look for:**

- Very active crawler, highly mobile.
- May hide on like colored objects in the tray.
- May be observed doing "push-ups" in the tray.

**Points of Note:**

When present in a sample, this organism will crawl out of the debris in the net. It is very active and extremely hard to miss. Often different sizes can extremely hard to miss. Often different sizes can be collected at the same site. For the smaller versions be sure to check the key characteristics.

Some of the darker verisons of perlidae can be confused for a giant stonefly.

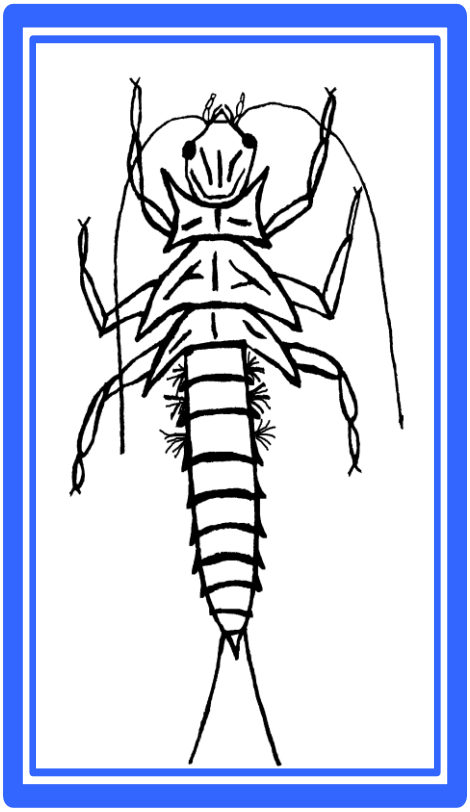
# MOST WANTED

# PANEL # 5B

# GIANT STONEFLY

**Genus** *Pteronarcys*
**Family** Pteronarcyidae
**Order** Plecoptera

**Ecological Information**
**Tolerance Value =** 0
**Feeding Group =** Shredder



**Key features to look for:**

- ☐ Very large organism (up to 1.5 inches).
- ☐ Robust body, pointed edges of abdomen & wing pads.
- ☐ Very dark body with white tips on antenna and tails.
- ☐ 2 tails at the end of the abdomen.
- ☐ Two sets of wing pads.
- ☐ Gill tufts on the sides of the first 3 sections of the abdomen.

**Key behaviors to look for:**

- ☐ This stonefly nymph is not very active, crawls slowly.
- ☐ May curl into a C-shape when disturbed.

**Points of Note:**

This organism can be confused with the common stonefly. A good indicator is the activity level. Compared to common stoneflies these move like sloths. Typically, only a few Pteronarcyidae are collected at any site when conditions are appropriate.

# MOST WANTED

# PANEL # 6A

# SADDLE CASE MAKER

**Genus** *Glossosoma*

**Family** Glossosomatidae

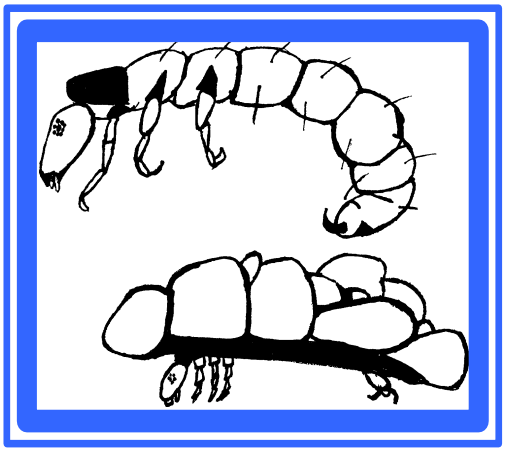
**Order** Trichoptera

**Ecological Information**

**Tolerance Value =** 0

**Feeding Group =** Scraper

Side view of Glossosoma larva without and in case



**Key features to look for:**

- ☐ Small oval stone case, turtle shell shape.
- ☐ Case is made of 15-25 very small pebbles.
- ☐ Underside of the case has 2 round openings.
- ☐ Larva body is cylindrical and slightly arc shaped.
- ☐ Larvae has light body with dark head and legs.
- ☐ No larger than 1/4 inch.

side view of case

**Key behaviors to look for:**

- ☐ This caddisfly larva is often attached to the surface of rocks in fast current.
- ☐ May not move at all when in the tray. If so it will crawl slowly along the bottom of the tray.

**Points of Note:**

This organism can be confused with other small case building caddisflies like *Apatania* and *Neophylax*. This caddisfly can be abundant under appropriate conditions.

Look very carefully for these very small caddisfly larvae. It may be easier to located by observing rocks in the stream before any kicks are made.

# MOST WANTED

# PANEL # 6B

# CORNUCOPIA CASE BUILDER

**Genus** *Apatania*

**Family** Limnephilidae

**Order** Trichoptera

**Ecological Information**

**Tolerance Value =** 3

**Feeding Group =** Scraper

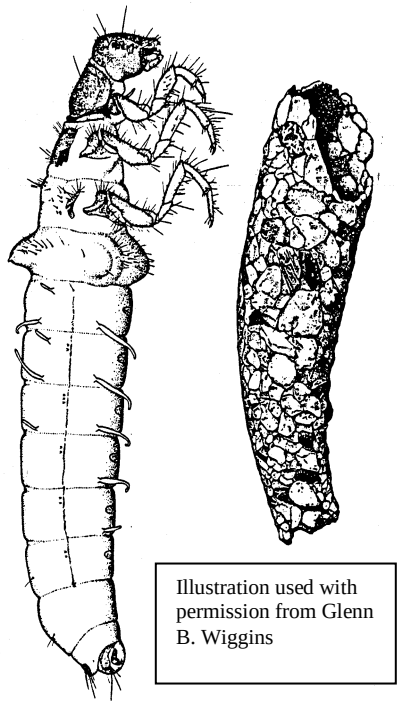


Illustration used with permission from Glenn B. Wiggins

**Key features to look for:**

- ☐ Very small case made of sand and shaped like a cornucopia
- ☐ Small cylindrical light bodied larva.
- ☐ Triangular head and dark legs.
- ☐ Hunched appearance when in the case.
- ☐ No larger than 1/4 inch

**Key behaviors to look for:**

- ☐ This caddisfly larva is fairly active and will crawl along the bottom of the tray.
- ☐ Resembles a hermit crab. Drags it's case along.

**Points of Note:**

This organism can be confused with other small case building caddisflies like Glossosoma and Hydroptilidae. This caddisfly can be abundant under appropriate conditions. Look very carefully for these very small caddisfly larvae.

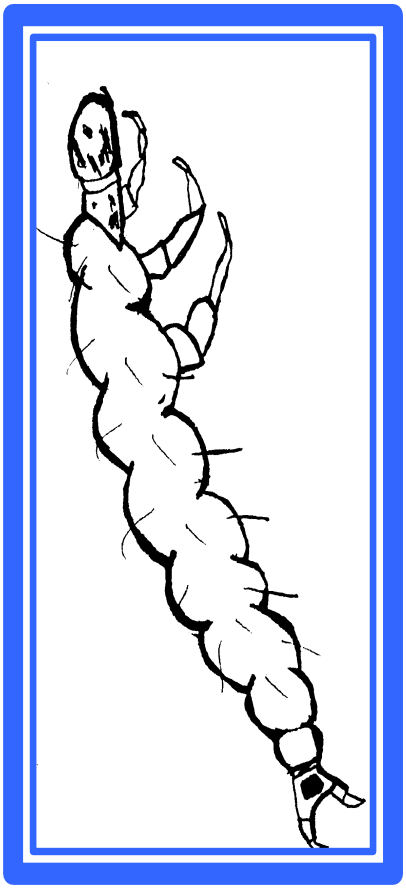
# MOST WANTED

# PANEL # 7

# MICHELIN-MAN CADDISFLY

**Genus** *Rhyacophila*
**Family** Rhyacophilidae
**Order** Trichoptera

**Ecological Information**
**Tolerance Value =** 0
**Feeding Group =** Predator



**Key features to look for:**

- ☐ Large cylindrical bright green body, up to 1 inch.
- ☐ Tan or patterned head.
- ☐ Short legs, all close to the head.
- ☐ Smooth lumpy abdomen, no gills.
- ☐ 2 hooks at the end of the abdomen

**Key behaviors to look for:**

- ☐ Clings to net very well.
- ☐ Moderately active organism. Will crawl or wiggle in the tray.
- ☐ Will try to hide under objects.
- ☐ Larvae do not build a case until it is about to pupate. Then, it will build a loosely constructed shelter out of small stones and gravel.

**Points of Note:**
This organism is often found in and amongst aquatic mosses. A key field characteristic is the bright green color, especially on the underside of the abdomen. Be careful not to confuse this organisms for Hydropsychidae, which can also have a green but has abomninal gills and a dark plate above each pair of legs.

# MOST WANTED

# PANELS # 8 A & B

# MID-SIZE PLANT CASE BUILDERS

**Genus** *Brachycentrus and Lepidostoma*

**Family** Brachycentridae and Lepidostomatidae

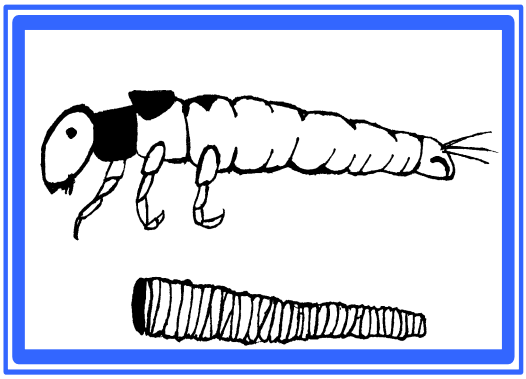
**Order** Trichoptera

**Ecological Information**

**Tolerance Value =** 1

**Feeding Group =** Shredder

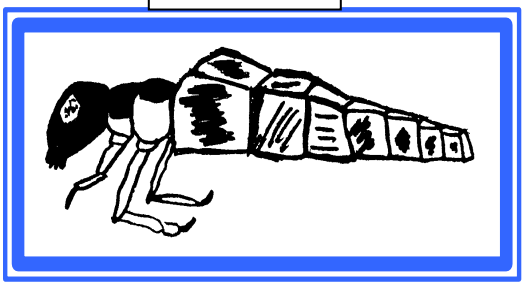
Brachycentrus **Panel 8A**



**Key features to look for:**

- ☐ Case constructed of organic material only.
- ☐ Each case is made from either strips or small blocks.
- ☐ Case and larvae taper from front to back.
- ☐ Larvae have light bodies with dark head and legs.
- ☐ At most 1/2 inch in length.

Lepidostoma **Panel 8B**



**Key behaviors to look for:**

- ☐ Cryptic neither will move around the tray very much.
- ☐ Cases may be attached to sticks, leaves, or larger rocks.
- ☐ When crawling, they resemble hermit crabs.

**Points of Note:**

These caddisfly larvae can be very abundant under the appropriate conditions. Look carefully when the sample contains old leaves, sticks, or bark.

# MOST WANTED

# PANEL # 9

# COMMON NET-SPINNER

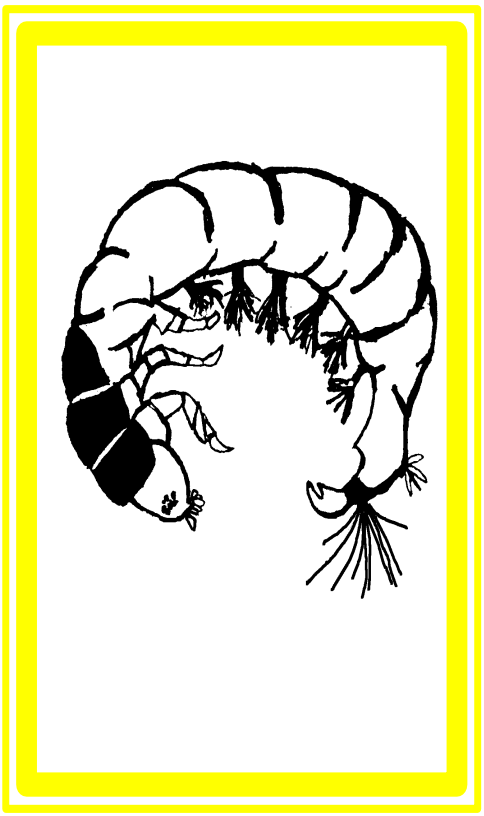
**Family** Hydropsychidae

**Order** Trichoptera

**Ecological Information**

**Tolerance Value =** 4

**Feeding Group =** Collector-filterer



**Key features to look for:**

- ☐ Worm-like body.
- ☐ Dark colored sometimes greenish body.
- ☐ Two paint brush-like tails at the end of the abdomen.
- ☐ Fluffy gills on the underside of the abdomen.
- ☐ Dirty or hairy appearance (sometimes).
- ☐ Two hooks at the end of the abdomen.
- ☐ Dark plate above each pair of legs.

**Key behaviors to look for:**

- ☐ Extremely active, wiggles violently back and forth.
- ☐ Gregarious, will form clumps of 2-4 in the tray.
- ☐ **MAY CLING STRONGLY TO THE NET**

**Points of Note:**

This is probably one of the most common organisms encountered during benthic sampling. These can be extremely abundant under appropriate conditions.

Because some are greenish in color they may be confused as *Rhyacophila*. Hydropsychidae have a dark plate above each pair of legs and fluffy gills on the underside of the abdomen, *Rhyacophila* do not. The tiny filtering nets of this organism can be observed on and between substrate.

# MODERATELY WANTED

# PANEL # 10

# FINGERNET CADDISFLY

**Genus** *Chimarra*

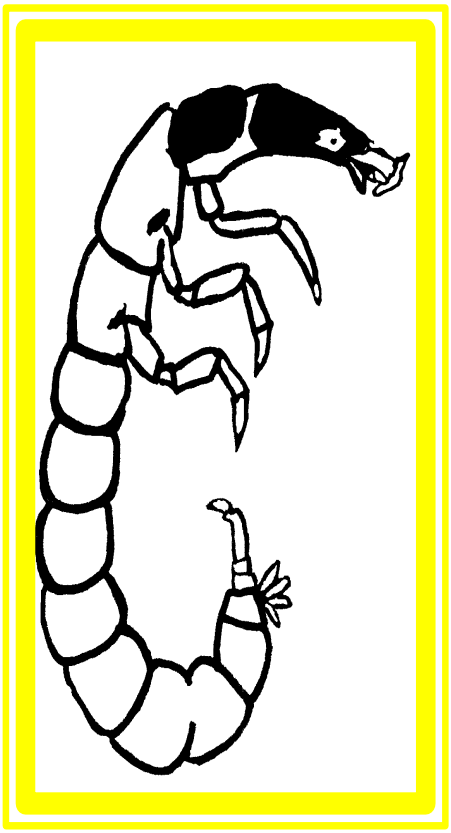
**Family** Philopotamidae

**Order** Trichoptera

**Ecological Information**

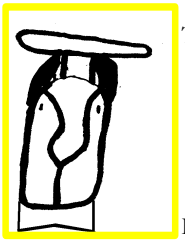
**Tolerance Value =** 3

**Feeding Group =** Collector-Filterer



**Key features to look for:**

- ☐ Orange head.
- ☐ Bright yellow, beige, white, or semi-transparent body.
- ☐ Slender worm-like body.
- ☐ No gills on or along the abdomen.
- ☐ T-Shaped mouthpart in-between jaws.
- ☐ 2 hooks at the end of the abdomen.
- ☐ Black border along the back edge of pronotum.



T-shaped mouthpart

Dark Band

**Key behaviors to look for:**

- ☐ Extremely active, wiggles violently back and forth.
- ☐ Gregarious, will form clumps of 2-4 in the tray.
- ☐ Very active, will crawl around the bottom of the tray.

**Points of Note:**

This is a very common organism encountered during benthic sampling. These can be extremely abundant under appropriate conditions. The filtering nets of this organism can be observed on and between substrate.

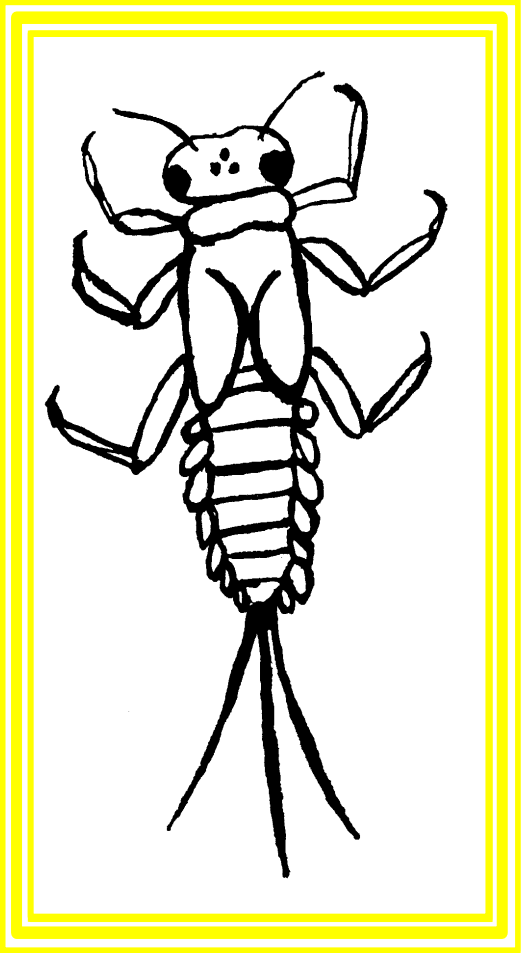
# MODERATELY WANTED

# PANEL # 11

# FLAT-HEAD MAYFLY

**Genus** *Stenonema*
**Family** Heptageniidae
**Order** Ephemeroptera

**Ecological Information**
**Tolerance Value =** 4
**Feeding Group =** Scraper



**Key features to look for:**

- ☐ Very flat body with long thin legs.
- ☐ 3 very long tails at the end of the abdomen.
- ☐ Single set of wing pads.
- ☐ Small round gills on the sides of the abdomen.
- ☐ Very broad flat head with large eyes.

**Key behaviors to look for:**

- ☐ This mayfly nymph is very mobile and can move and swim fast when in water.
- ☐ Doesn't move well in the net.
- ☐ Occasionally it may swim by undulating from side to side.
- ☐ It will try to hide on any flat dark colored object like stones, leaves, and other invertebrates.

**Points of Note:**

This mayfly can be found in many of the streams across Connecticut. They can be found by slowly lifting cobbles out of the water. They may run to the other side of the rock. Be sure not to confuse this organism with the 2-tailed version (*Epeorus*). The legs, gills, and tails tend to break off during the collection process.

# MODERATELY WANTED

# PANEL # 12

# WATER PENNY BEETLE LARVA

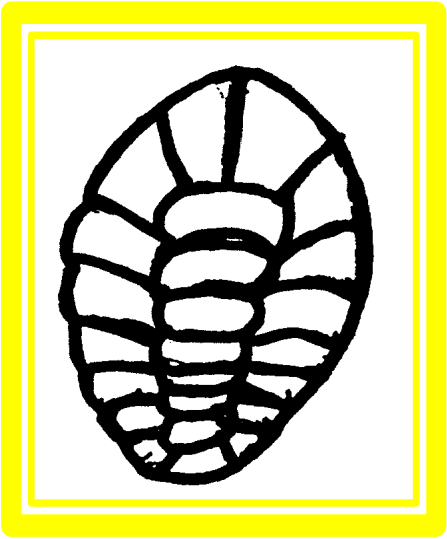
**Genus** *Psephenus*
**Family** Psephenidae
**Order** Coleoptera

**Ecological Information**

**Tolerance Value =** 4

**Feeding Group =** Scraper

Top view



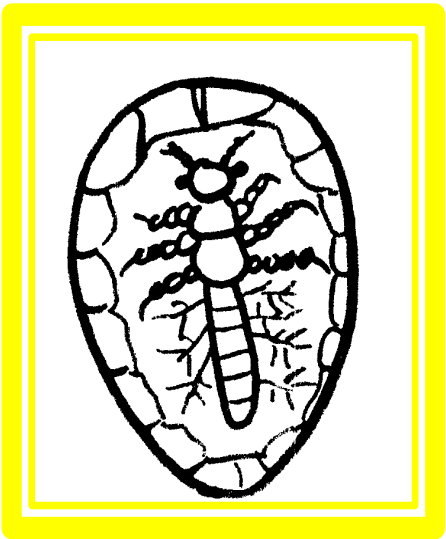
**Key features to look for:**

- ☐ Small disc shape organism.
- ☐ Very flat.
- ☐ Uniformly brown.
- ☐ No visible head or legs from top view.

**Key behaviors to look for:**

- ☐ Sticks very well to rocks.
- ☐ Glides along the bottom of the tray.
- ☐ May curl up when disturbed
- ☐ Very cryptic.

Bottom view



**Points of Note:**

Water penny beetle larva are very distinctive. They can also be very hard to locate in the field. Look very closely at the surfaces of rocks. Water penny beetle larva will adhere extremely close to the surface. These organisms can be locally abundant when conditions are appropriate.

# MODERATELY WANTED

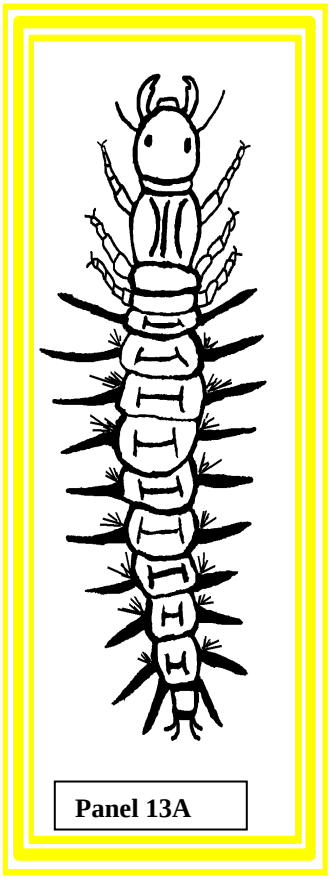
# PANELS # 13A & 13B

# DOBSONFLY AND FISHFLY

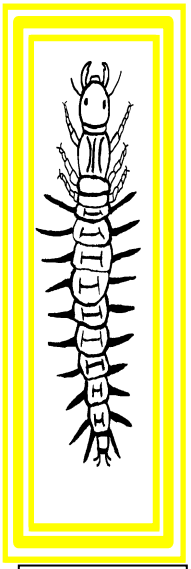
| Ecological Information | |
|---|---|
| Tolerance Values = | 6 and 4 |
| Feeding Group = | Predator |

**Genus** *Corydalus and Nigronia*
**Family** Corydalidae
**Order** Megaloptera

*Corydalus* (Dobsonfly larva) *Nigronia* (Fishfly larva)



**Panel 13A**



**Panel 13B**

**Key features to look for:**

- ☐ Elongate body with a pair of long thin appendages on each section of the abdomen.
- ☐ Large pinching mouth parts.
- ☐ Set of hooks at the end of the abdomen.
- ☐ Nigronia can be up to 2 inches and do not have gills at the base of the abdominal projections.
- ☐ *Corydalus* can be extremely large (up to 4 inches) and a tuft of fluffy gills at the base of each abdominal projection.

**Key behaviors to look for:**

- ☐ Very mobile, both will be very active crawling or wiggling in the tray.
- ☐ Will curl the abdomen around your finger if picked up.
- ☐ May cling to the net.

**Points of Note:**

Large *Corydalus* are capable of inflicting a painful pinch with their mandibles. Please use care when handling these organisms.

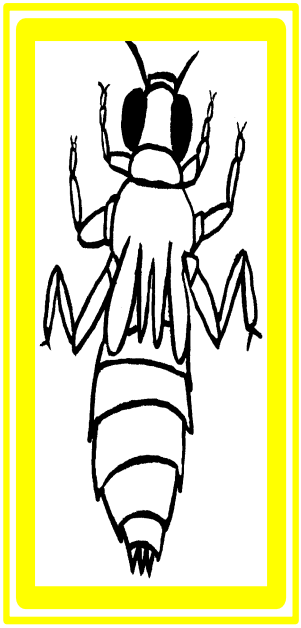
# MODERATELY WANTED

# PANEL # 14

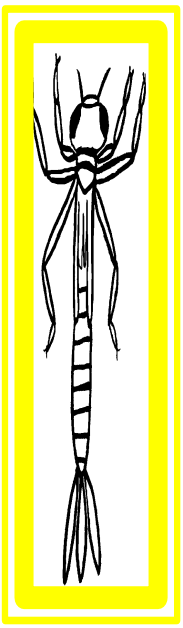
# DRAGONFLIES AND DAMSELFLIES

**Order** Odonata

Dragonfly Nymph



Damselfly Nymph



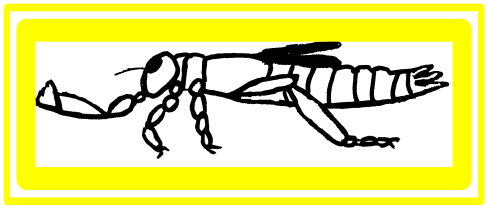
**Ecological Information**

**Tolerance Value =** 5

**Feeding Group =** Predator

**Key features to look for:**

- ☐ Very large eyes.
- ☐ Extendable lower jaw.
- ☐ 2 sets of wing pads.
- ☐ Dragonfly nymphs have a robust body shape.
- ☐ Dragonfly nymphs have 3 short spike-like tails.
- ☐ Dragonfly nymphs can be up to 2 inches in length.
- ☐ Damselfly nymphs have a slender body shape.
- ☐ Damselfly nymphs have 3 long thin or feather-like tails.



Side view of a dragonfly nymph with the lower jaw extended

**Key behaviors to look for:**

- ☐ Both are very mobile.
- ☐ Dragonflies move quickly with jet propulsion or walk.
- ☐ Damselflies move by wiggling side to side.

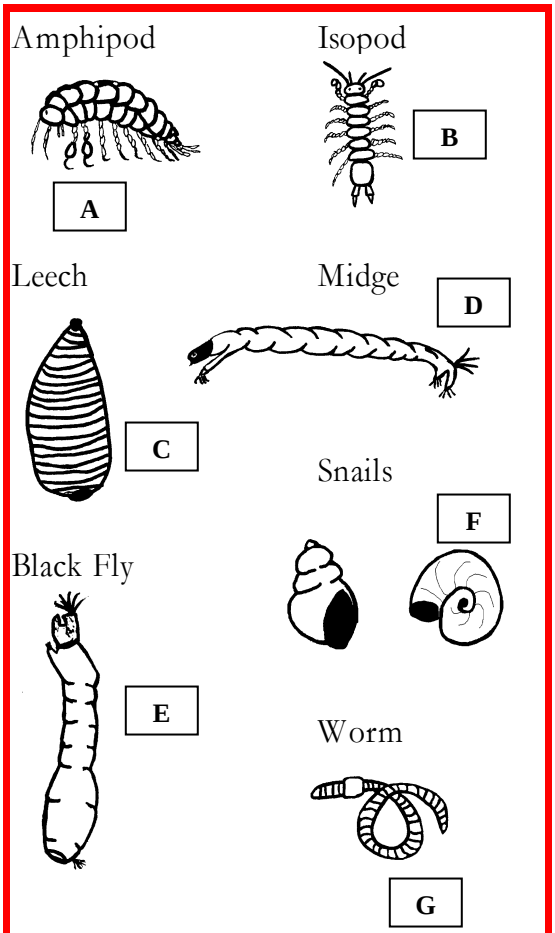
**Points of Note:**

Dragonfly nymphs can be very common when conditions are appropriate. There are several types of dragonflies and damselflies found in riffle areas. The majority of species live in slow moving or standing standing water.

# MODERATELY WANTED

# PANEL # 15 A - G

# Scuds, Aquatic Sowbugs, Leech, Midge, Black Fly, Snail, and Worm.




**Ecological Information**

| Tolerance Values = | | Feeding groups = |
|---|---|---|
| Amphipod (scud) | 8 | Collector-gatherer |
| Isopod (sowbug) | 8 | Collector-gatherer |
| Leech | 8 | Predator |
| Midge | 7 | Collector-gatherer |
| Black fly | 6 | Collector-filterer |
| Snail | 7 | Scraper |
| Worm | 9 | Collector-gatherer |

**Key features to look for:**

- ☐ Number of legs
- ☐ General body form
- ☐ Presence/absence of a true shell

**Key behaviors to look for:**

- ☐ Amphipods swim on their sides very fast
- ☐ Isopods crawl slowly amongst the debris.
- ☐ Leeches will stick to the bottom of tray and move like inch-worms.
- ☐ Midges swim by violent side to side wiggling. Some midge larvae may be bright red in color.
- ☐ Black flies will attach to the bottom of the tray and move like inch-worms.

**Points of Note:**

Look carefully for midge and black fly larvae, they are extremely small.

# LEAST WANTED